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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/646,098	08/22/2003	Harry L. Tuller	MIT.9908	8403
51414	7590	12/05/2005	EXAMINER	
GOODWIN PROCTER LLP PATENT ADMINISTRATOR EXCHANGE PLACE BOSTON, MA 02109-2881			CONNELLY CUSHWA, MICHELLE R	
			ART UNIT	PAPER NUMBER
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DATE MAILED: 12/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

2/

Office Action Summary	Application No. 10/646,098	Applicant(s) TULLER ET AL.	
	Examiner Michelle R. Connelly-Cushwa	Art Unit 2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 October 2005.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-9 and 11-16 is/are pending in the application.
4a) Of the above claim(s) 3-5 and 11-13 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1,7-9 and 14-16 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☒ Claim(s) 1,3-9 and 11-16 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 22 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

Applicant's Amendment filed October 3, 2005 has been fully considered and entered.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 7 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 7; claim 7 depends from claim 6, which has been cancelled.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swartz et al. (US 5,198,269) in view of Rehrig et al. ("Piezoelectric properties of zirconium-doped barium titanate single crystals grown by templated grain growth").

Regarding claims 1 and 9; Swartz et al. discloses an optical structure (see column 1, lines 25-27) and a method of forming the optical structure, comprising:

- a substrate having a surface; and
- a modified barium titanate $[(\text{Sr},\text{Ba})\text{TiO}_3 \text{ or } (\text{Ba}(\text{Ti},\text{Zr})\text{O}_3)]$ thin film deposited on the surface of the substrate (see the abstract);
- wherein the substrate comprises Si or SOI with an optical buffer layer (the first layer of a sol-gel perovskite; see the abstract).

Swartz et al. does not specifically state that the barium titanate includes 2 to 20 mol% of $\text{Zr}(\text{BaZrO}_3)$. Rehrig et al. discloses that $\text{Zr}(\text{BaZrO}_3)$ within the range of 2-20 mol% may be used to stabilize barium titanate. Since, Swartz et al. suggests that the barium titanate film is modified with $\text{Zr}(\text{BaZrO}_3)$, one of ordinary skill in the art would have found it obvious to incorporate 2-20 mol% of $\text{Zr}(\text{BaZrO}_3)$ in the modified barium titanate film disclosed by Swartz et al. to stabilize the film.

Claims 1, 7-9 and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over McKee et al. (US 6,103,008) in view of Rehrig et al. ("Piezoelectric properties of zirconium-doped barium titanate single crystals grown by templated grain growth").

Regarding claims 1, 7, 9, 15 and 16; McKee et al. discloses an optical structure and a method of forming the optical structure, comprising:

- a substrate (22 in Figure 2; 72 in Figure 5) having a surface; and

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- a modified barium titanate thin film (24 in Figure 2; 74 in Figure 5; see column 2, line 59, through column 3, line 12) deposited on the surface of the substrate
- wherein the substrate (22, 72) comprises Si or SOI (see column 2, lines 34-35) with an optical buffer layer (23 in Figure 2; 73 in Figure 5; MgO).

McKee et al. does not specifically stating that the barium titanate includes 2 to 20 mol% of $\text{Zr}(\text{BaZrO}_3)$. Rehrig et al. discloses that $\text{Zr}(\text{BaZrO}_3)$ within the range of 2-20 mol% may be used to stabilize barium titanate. Since, McKee et al. suggests that the barium titanate film is modified with Zr, one of ordinary skill in the art would have found it obvious to incorporate 2-20 mol% of $\text{Zr}(\text{BaZrO}_3)$ in the modified barium titanate film disclosed by McKee et al. to stabilize the film.

Regarding claims 8 and 14; the structure further comprises electrodes (78, 80 in Figure 5) on a surface of the modified barium titanate thin film configured to form an electro-optic structure (see column 6, lines 26-43).

Response to Arguments

Applicant's arguments filed October 3, 2005 have been fully considered but they are not persuasive.

Regarding the rejections of claims 1, 6, 9 and 15 under 102(b) over Swartz et al. (US 5,198,269) set forth in the previous Office action:

Applicant states that the Examiner considers the first sol-gel perovskite layer of Swartz et al. to be an optical buffer layer, but that this layer would not confine the light within the modified barium titanate. The claim does not require the buffer layer to confine the light within the modified barium titanate. Buffer layers are commonly grown on substrates to enable better formation of additional layers thereon.

Applicant states that Swartz et al. does not teach or suggest modified barium titanate deposited on a substrate with an optical buffer layer, as recited in amended independent claim 1. The Examiner disagrees for the reasons set forth above.

Furthermore, claim 1 is a product-by-process claim. Applicant is claiming the product including the process of making the thin film, and therefore, claim 1 is of "product-by-process" nature. The courts have been holding for quite some time that: the determination of the patentability of product-by-process claim is based on the product itself rather than on the process by which the product is made. *In re Thrope*, 777 F. 2d 695, 227 USPQ 964 (Fed. Cir. 1985); and patentability of claim to a product does not rest merely on a difference in the method by which that product is made. Rather, it is the product itself which must be new and unobvious. Applicant has chosen to claim the invention in the product form. Thus a prior art product which possesses the claimed product characteristics can anticipate or render obvious the claim subject matter regardless of the manner in which it is fabricated. A rejection based on 35 U.S.C. section 102 or alternatively on 35 U.S.C. section 103 of the status is eminently fair and acceptable. *In re Brown and Saffer*, 173 USPQ 685 and 688; *In re Pilkington*, 162 USPQ 147. As such no weight is given to the process steps recited in claim 1.

Applicant states the Swartz et al. does not teach or suggest depositing a modified barium titanate on a surface of a substrate, as recited in independent claim 9, but teaches the steps of depositing sol-gel precursor layers and performing a heat treatment to crystallize the sol-gel precursors.

The Examiner agrees that Swartz et al. teaches that the thin film is formed by depositing and heating steps (see the abstract). The combination of depositing and heating includes depositing.

The translation term "comprising", which is synonymous with "including", "containing", or "characterized by," is inclusive or open-ended and does not exclude additional, unrecited elements or method steps. *Moleculon Research Corp. v. CBS, Inc.*, 793 F.2d 1261, 229 USPQ 805 (Fed. Cir. 1986) *In re Baxter*, 656 F.2d 679, 210 USPQ 795, 803 (CCPA 1981); *Ex parte Davis*, 80 USPQ 448, 450 (Bd. App. 1948) ("comprising" leaves "the claim open for the inclusion of unspecified ingredients even in major amounts").

Regarding the rejection of claims 1, 6-9 and 14-16 under 35 U.S.C. 102(b) over McKee et al. (US 6,103,008) set forth in the previous Office action:

Applicant states that McKee does not teach or suggest a structure including barium titanate in which Ti is substituted with Zr on the B site. This is not in the claim.

Applicant further states that McKee does not teach or suggest modified barium titanate comprising barium titanate including 2 to 20 mol % of Zr(BaZrO₃). However, McKee et al. was not solely relied upon for this teaching. Rehrig et al. was relied upon

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for the teaching that $\text{Zr}(\text{BaZrO}_3)$ within the range of 2-20 mol% may be used to stabilize barium titanate.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Regarding the rejections of claims 2 and 10 under 35 U.S.C. 103(a) over McKee et al. (US 6,103,008) in view of Rehrig et al. ("Piezoelectric properties of zirconium-doped barium titanate single crystals grown by templated grain growth") and under 35 U.S.C. 103(a) over Swartz et al. (US 5,198,269) in view of Rehrig et al. ("Piezoelectric properties of zirconium-doped barium titanate single crystals grown by templated grain growth") set forth in the prior Office action:

Applicant states that the Examiner concedes that neither McKee or Swartz disclose modified barium titanate comprising 2 to 20 mol % of $\text{Zr}(\text{BaZrO}_3)$ and that the Examiner relies on Rehrig et al. to teach thin films including these compositions. However, Rehrig et al. is only relied on for the teaching that 2 to 20 mol % of $\text{Zr}(\text{BaZrO}_3)$ stabilizes barium titanate. Since, McKee et al. and Swartz et al. each disclose barium titanate thin films, it would have been obvious to one of ordinary skill in the art to incorporate 2 to 20 mol % of $\text{Zr}(\text{BaZrO}_3)$ to stabilize the barium titanate thin films of McKee et al. and Swartz et al.

Applicant further states that Rehrig et al. teaches the use of stabilized barium titanate for sensor and actuator applications, while the invention of McKee et al. is intended for electro-optical applications. Applicant additionally states that one of ordinary skill in the art would not be motivated to substitute the barium titanate thin film of McKee intended for electro-optical applications with the single crystal of Rehrig intended for sensor and actuator applications. Electro-optical sensors and actuators are known, however, it is important to note that the rejection set forth above does not suggest substituting the barium titanate thin film with the single crystal of Rehrig. Rather, it is set forth that one of ordinary skill in the art would be motivated to stabilize the barium titanate thin film by incorporating 2 to 20 mol % of $\text{Zr}(\text{BaZrO}_3)$, which stabilizes barium titanate as taught by Rehrig et al., in the thin film of McKee et al.

Applicant states that the teachings of McKee and Rehrig are not combinable since the formation of bulk single crystals by templated grain growth is inconsistent with the formation of thin films on semiconductor substrates and that there is no motivation to substitute the barium titanate thin film of Swartz formed from a sol-gel precursor with the single crystal of Rehrig formed by templated grain growth. The Examiner reiterates that the only teaching that Rehrig is relied upon for is that 2 to 20 mol % of $\text{Zr}(\text{BaZrO}_3)$ stabilizes barium titanate. Given this teaching, one of ordinary skill in the art would have found it obvious to incorporate 2 to 20 mol % of $\text{Zr}(\text{BaZrO}_3)$ in a barium titanate thin film to stabilize it.

Conclusion

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning the merits of this communication should be directed to Examiner Michelle R. Connelly-Cushwa at telephone number (571) 272-2345. The examiner can normally be reached 9:00 AM to 7:00 PM, Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney B. Bovernick can be reached on (571) 272-2344. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general or clerical nature should be directed to the Technology Center 2800 receptionist at telephone number (571) 272-1562.


Michelle R. Connelly-Cushwa
Patent Examiner
November 30, 2005